Notice of Allowability	Application No.	Applicant(s)	
	09/607,122	EDELSBRUNNER ET AL.	
	Examiner	Art Unit	
	Samuel Broda	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Applicants' Amendment After Final dated 18 January 2005*.

2. ☒ The allowed claim(s) is/are *1-22,36-40,42-46 and 52-56*.

3. ☒ The drawings filed on *13 April 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

A Broda

SAMUEL BRODA, ESQ.
PRIMARY EXAMINER

1. This communication is in response to Applicants' Amendment After Final sent via facsimile on 18 January 2005. Claims 52, 54 and 55 were amended; claims 1-22, 36-40, 42-46, and 52-56 are pending.

Reasons for Allowance

2. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) a method of modeling a surface of an object, including the step of repeated vertex removal (Dey et al, "Topology Preserving Edge Contraction");

(2) the advantages of converting arbitrarily triangulated domains to quadrangulations (Ramaswami et al, "Converting Triangulations to Quadrangulations"); and

(3) a quadric-based simplification using a greedy algorithm to contract the lowest-cost edge (Heckbert et al, "Optimal Triangulation and Quadric-Based Surface Simplification").

2.1 Applicants' first set of claims consists of claims 1-6, 16-18, 36-37, and 46.

Independent claims 1 and 46 are directed to a computer-implemented method of modeling a three-dimensional surface of an object; independent claim 36 is the computer program product claim corresponding to claim 1; independent claim 16 is directed to a computer-implemented method of generating a three-dimensional model of an object. Each claim

identifies the distinct steps of: "generating from an initial triangulation of the surface, a hierarchy of progressively coarser triangulations of the surface by performing a sequence of edge contractions to the initial triangulation" and "homeomorphically mapping edges of a triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 1-6, 16-18, 36-37, and 46 are deemed allowable.

2.2 Applicants' second set of claims consists of claims 7-9.

Independent claim 7 is directed to a computer-implemented method of modeling a three-dimensional surface of an object. This claim identifies the distinct steps of: "generating from an initial triangulation of the surface, a hierarchy of progressively coarser triangulations of the surface by decimating the initial triangulation using a sequence of edge contractions that are prioritized by an error function that measures a respective error caused by the edge contractions in the sequence" and "homeomorphically mapping edges of a coarsest triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 7-9 are deemed allowable.

2.3 Applicants' third set of claims consists of claims 10-15.

Independent claim 10 is directed to a computer-implemented method of modeling a three-dimensional surface of an object. This claim identifies the distinct steps of: "generating from an

initial triangulation of the surface, a hierarchy of progressively coarser triangulations of the surface by repeatedly decimating the initial triangulation using a sequence of edge contractions that are prioritized by an error function that measures a respective error caused by the edge contractions in the sequence" and "homeomorphically mapping edges of a coarsest triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 10-15 are deemed allowable.

2.4 Applicants' fourth set of claims consists of claim 19.

Independent claim 19 is directed to a computer-implemented method of modeling a three-dimensional surface of an object. This claim identifies the distinct steps of: "determining a fuzzy rank associated with the first edge contraction" and "determining a simplicial homeomorphism based on the fuzzy rank."

Because the closest prior art does not appear to teach or suggest the determination of a simplicial homeomorphism based on fuzzy rank, claim 19 is deemed allowable.

2.5 Applicants' fifth set of claims consists of claims 20-22.

Independent claim 20 is directed to a computer-implemented method of modeling a three-dimensional surface of an object. This claim identifies the distinct steps of: "generating from an initial triangulation a hierarchy of progressively coarser triangulations of the surface by performing a sequence of edge contractions to the initial triangulation" and "mapping edges of a triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 20-22 are deemed allowable.

2.6 Applicants' sixth set of claims consists of claims 38-40.

Independent claim 38 is directed to a computer program product for modeling a three-dimensional surface of an object. This claim identifies the distinct steps of: "means that generates from an initial triangulation of the surface, a hierarchy of progressively coarser triangulations of the surface by decimating the initial triangulation using a sequence of edge contractions that are prioritized by a quadratic error function that measures a respective error caused by the edge contractions in the sequence" and "means that homeomorphically maps edges of a coarsest triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 38-40 are deemed allowable.

2.7 Applicants' seventh set of claims consists of claims 42-44.

Independent claim 42 is directed to an apparatus that generates models of objects. This claim identifies the distinct limitations of: "means for generating from an initial triangulation of the model a hierarchy of progressively coarser triangulations of the model using a sequence of edge contractions to the initial triangulation" and "means for homeomorphically mapping edges of a coarsest triangulation in the hierarchy back to the initial triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations via edge contractions, claims 42-44 are deemed allowable.

2.8 Applicants' eighth set of claims consists of claims 52-56.

Independent claim 52 is directed to a computer program product for modeling three-dimensional objects; independent claim 55 is the corresponding apparatus claim. This claim identifies the distinct steps of: "means configured to homeomorphically map edges of a triangulation in the hierarchy of progressively coarser triangulations back to the initial triangulation" and "means configured to convert the triangulation into a quadrangulation by matching pairs of adjacent triangles in the triangulation."

Because the closest prior art does not appear to teach or suggest the generation of a hierarchy of coarser triangulations and conversion to a quadrangulation, claims 52-56 are deemed allowable.

3. Any comments considered necessary by Applicants must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Samuel Broda, whose telephone number is (571) 272-3709. The Examiner can normally be reached on Mondays through Fridays from 8:00 AM – 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska can be reached at (571) 272-3716. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (571) 272-2100.

SAMUEL BRODA, ESQ.
PRIMARY EXAMINER